

590

# Water Purification

PENNSYLVANIA  
SANITATION  
COMPANY

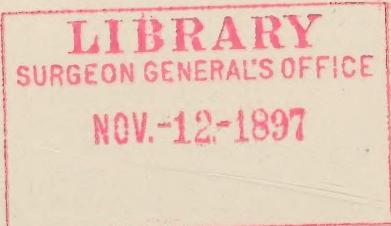
BETZ BUILDING  
PHILADELPHIA



THE PENNSYLVANIA  
SANITATION COMPANY  
DESIGNERS AND BUILDERS OF

# WATER PURIFICATION PLANTS

BETZ BUILDING  
BROAD ST. AND S. PENN SQUARE,  
PHILADELPHIA, PA.





The company designed and built the sewage purification plant for the City of Reading, Pa. (population nearly 100,000). The chemical and bacterial analysis of the crude sewage entering the plant, and of the effluent water leaving it, were made in the Laboratories of the Jefferson Medical College, Philadelphia, Pa., by Doctors W. M. L. Coplin and H. F. Harris, Professors of Pathology and Bacteriology. They report, as a result of their analysis, that the effluent water is purified to the extent of 99.99 per cent., practically removing all animal and vegetable matter.

#### BUSINESS PROPOSITIONS.

The Company is prepared to contract with any City, Town, Corporation, College, Institution, Manufactory, etc., as follows:—

1st. To design, construct, and equip the water purification system for a stipulated price, transferring all patent rights to the city or corporation.

2d. To design, construct, and equip the water purification system, maintaining and operating it at its own expense. The company to be paid an annual rental by the city or corporation.

3d. To design the water purification system, providing full sets of general drawings, specifications, detail drawings, supervision, and the transfer of all patent rights. The city or corporation to place the work under construction in a manner it may deem proper and best.

# WATER PURIFICATION.

BY

THE PENNSYLVANIA SANITATION COMPANY,

Designers and Builders,

BETZ BUILDING, BROAD ST. AND SOUTH PENN SQUARE, PHILADELPHIA.

*Process patented in the United States, Canada, and Great Britain.*

THE science of water purification, within the past few years as developed in America and Europe, from actual experiences and experiments, has given general knowledge to the world in a way that is most useful to suffering humanity. Its lessons of wisdom should be followed by all cities, towns, villages, and institutions that are progressive and desirous of improving the health, happiness, and comfort of their inhabitants by reducing their sick and death rate, while increasing their life duration.

All surface waters that become the basis for the water supplies of municipalities or communities, whether in streamlets, creeks, or rivers, are dangerously polluted by the wastes from habitations of men and animals that live adjacent to them. These water courses are the bottoms or lowest points of the slopes of all watersheds, and the collection basins for all streams, creeks, or rivers that must eventually reach the oceans. Every rainfall adds to the pollution by its washing of the adjacent slopes.

The theoretical propositions and the practical demonstrations of water purification have reached a point, that it should now be considered an exact sanitary science. Our process demonstrates the certainty of it as exemplified in existing works.

This company as designers and builders are prepared to design, construct and equip water purification plants. They can be located at the "intakes," and directly over, or adjacent to the reservoirs. The water may be purified either before or after it reaches the pumps, watertowers, or reservoirs.

The absolute elements that are essential to perfect water purification are combined and provided in the processes of

the company, viz : sand-filtration by gravity, without the aid of chemicals ; constant aeration and oxygenation ; exposure of water to air and sunlight ; culture beds to promote healthy, active, living micro-organisms, and the destruction of disease germs or bacilli ; oxidation and the generation of electricity by the concussion of falling drops of water.

The filter beds are elevated above the highest water level of the reservoirs, and are supported on wrought steel, masonry, or combination of them with wood.

The water to be purified is brought by gravity, or forced by pumping, to the usual elevation for discharging into a reservoir. At this level the discharge or force main is extended to the end of the filter beds with lateral pipes and distributers, each line being controlled by a valve.

The structure should preferably be built of wrought steel or cast-iron columns, supported on stone or steel beams and concrete foundations, located in bottom of reservoir. The upper portion of the purification beds consists of steel beam construction with wrought steel plate divisions and girders. The bed is divided into compartments, each of 1,000,000 gallons daily capacity, and the whole cluster is arranged so as to work the compartments separately or jointly.

On steel tubes or bars about eight to ten feet above the high water level of reservoir is placed the filtering material, usually two feet in depth, consisting of layers of broken stone in various sizes and of selected sand, and over the latter is placed lattice screens.

The wide deck or gallery over the beds is provided with a tramway to enable an easy handling of materials during operation of the plant. From the gallery the attendant regu-

## WATER PURIFICATION.

lates all the lateral valves, and from it, the entire structure is visible to him at all times. The usual guard rails are provided for safety.

The water to be purified reaches the laterals by opening the gate valves on main pipe or conduit, and from these laterals there are open distribution troughs which fill up and discharge the water in thin films by overflowing all sides of them, thereby exposing the water to the favorable action of light and air. The water in descending strikes the lattice floors, scattering it in sprays and small parts, producing a thorough mixture with the oxygen of the atmosphere. The water is regulated so as to have about a foot head over the entire area of each compartment, and aided by gravity it percolates through the filtering materials. On the upper surface of the filters are stopped and held all matters that may be in suspension in the water, while within the bed the hardy bacilli or micro-organisms are actively at work in the process of purification of the water, converting all animal and vegetable matter into a harmless mineral product. As the bed is exposed to the atmosphere both from above and below it, there is kept up an abundant and constant circulation of oxygen, which is absolutely essential to multiply and keep alive in a healthy condition the millions of hardy scavenger micro-organisms who are at work within the beds. By this method are destroyed all disease-producing germs or bacteria usually within the polluted waters. The effluent is colorless, bright, and sparkling drinking water, and free from all disease bacteria.

To further oxidize the water, it leaves the bottom of filter in drops like rain, so that, in passing through the atmosphere for ten feet, the atoms of water are completely oxygenized by their contact with the large volume of air. Should any microbes be present, they would be burnt up and destroyed by this oxidation.

The drops of water in their descent strike upon the upper surface of the water in the reservoir, which concussion charges it electrically, adding further to its purification.

The water purified by all these methods is sparkling,

bright, and clear ; in fact, it is substantially chemically and bacteriologically pure, as from 96 to 98 per cent. of all animal and vegetable matters are removed.

In operation, it is only needful to rake the surface of the filter when it is clogging, and the removal of one-fourth to one-half inch of sand every two to four weeks, together with the sediment and gelatinous deposit upon it. Fresh sand is used to replace the small quantity which has been removed.

The process can be used with equally satisfactory results by constructing the purification beds on the ground adjacent to reservoirs either above or below them, or it may be located at the "intakes" from creeks or rivers.

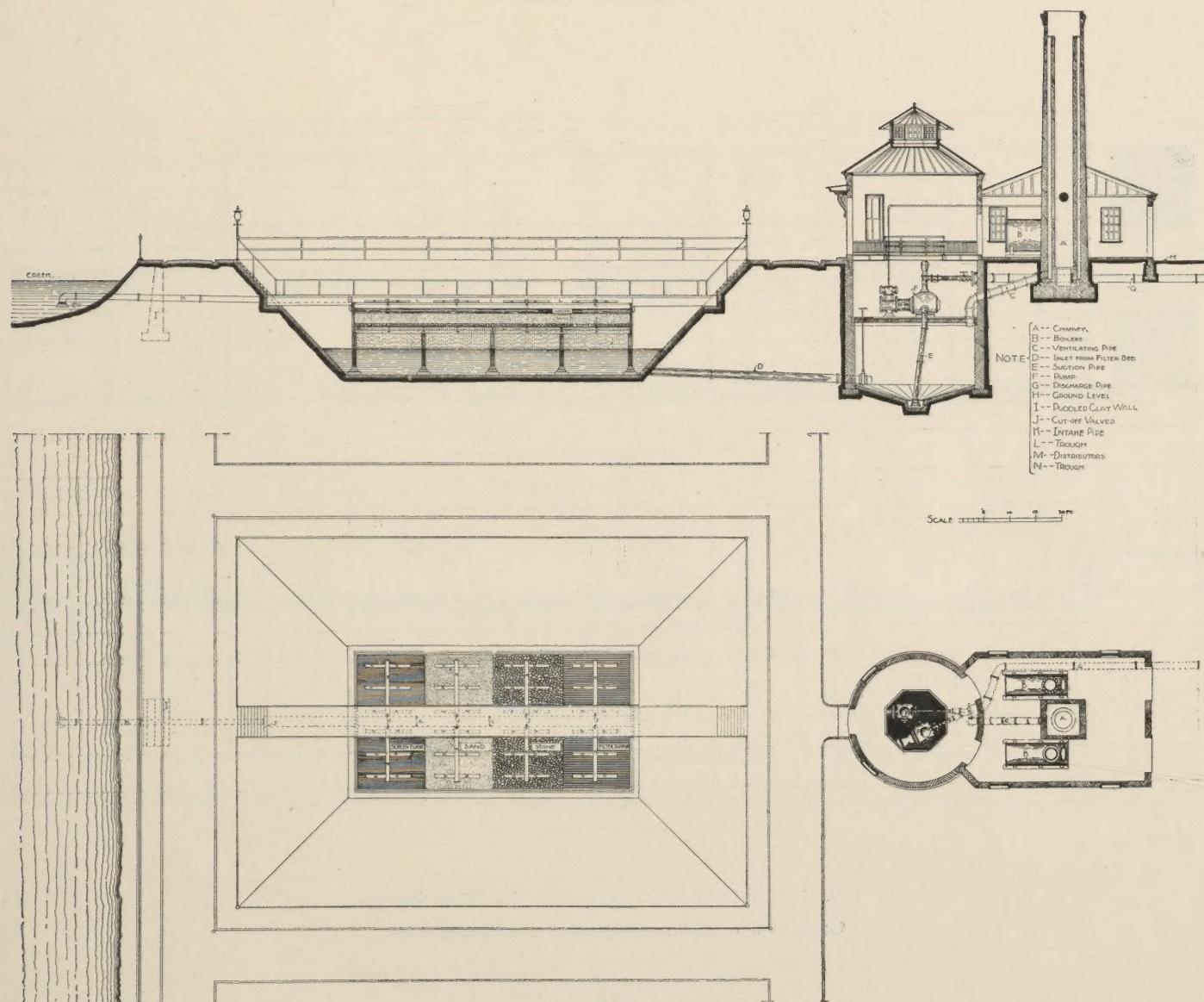
The beds located on the ground are provided with combined effluent drains and fresh air supplies, with laterals at close intervals, having outlets above the water level over filter beds. By this method sufficient air is conducted to the bottom of beds, and is kept in constant circulation throughout the entire area.

The purified water is conducted to the reservoir, or to the clear water tank at the head of the supply, the water tower or standpipe, or to the service main of city or town.

The upper portion has gallery distributing system, etc., etc., the same identically as provided over the reservoirs.

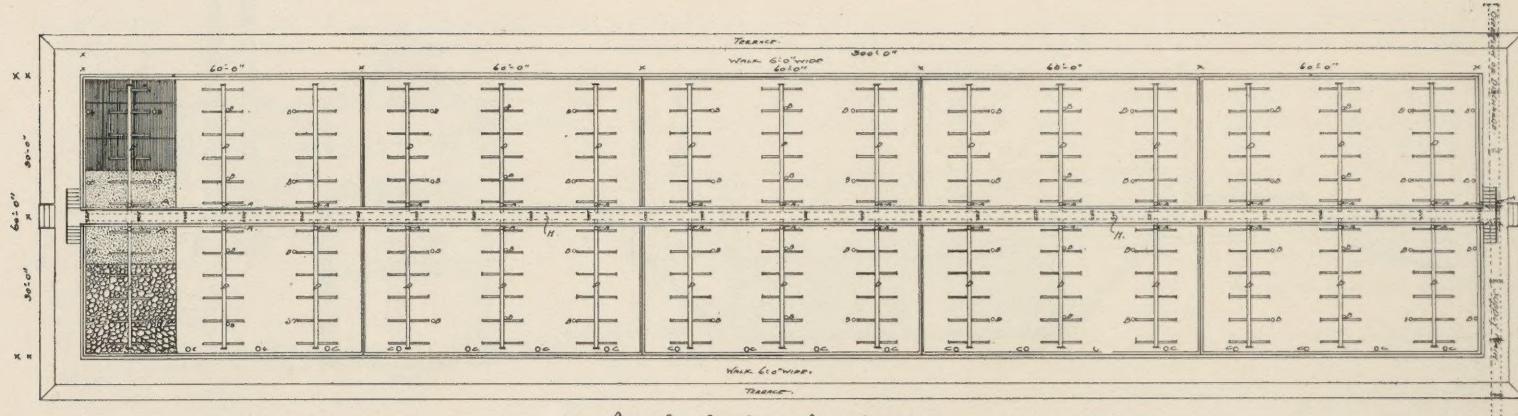
The area is divided into compartments for 1,000,000 gallons daily capacity, the divisions being tank steel, masonry, or concrete work.

The filtration area, per 1,000,000 gallons per day, is ten to twelve times greater than used or employed by any of the companies engaged in filtration of water. All water passing through the beds goes to reservoir or water tower for domestic purposes; none of it is used or required for washing filters, as in most all other processes. The water is absolutely purified, not simply clarified, as is the case with other methods employed. The reservoirs are kept free from sediment, mud, or other deposits, effecting a large economy in their maintenance and operation. It is possible by this process to utilize a sewage polluted stream as a drinking water supply for any community.

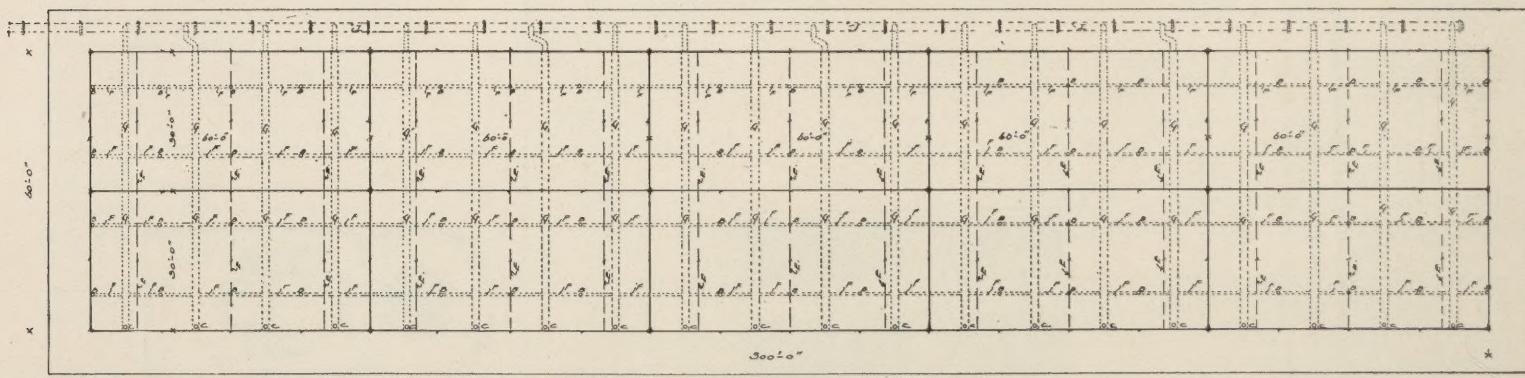


ELEVATED FILTER BEDS AND PUMPING STATION ADJOINING A CREEK.

Capacity one million gallons every twenty-four hours.



### PLAN OF FILTER BED - SHOWING PLATEFORM, DISTRIBUTORS ETC.



Part of filter bed showing gutter 6-40.

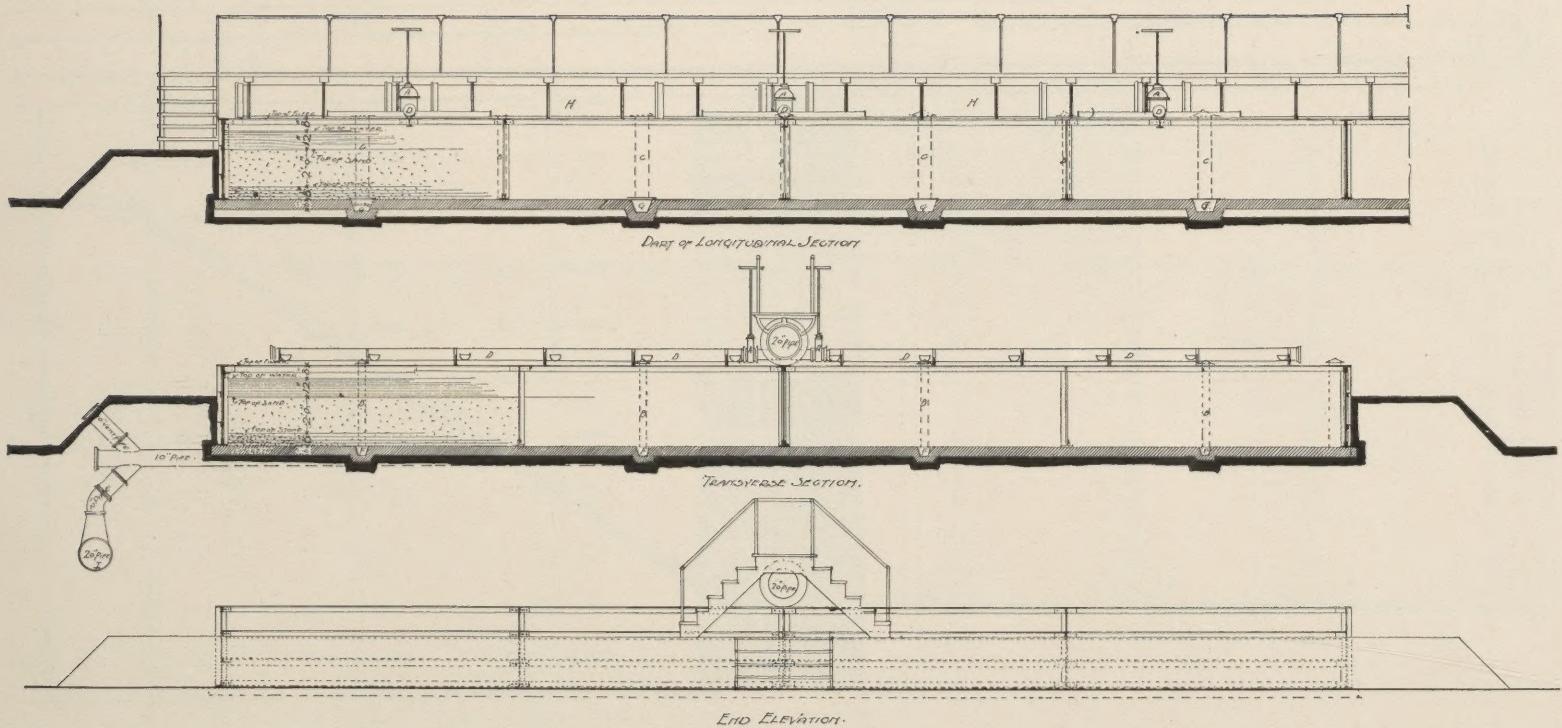
## PLANS OF FILTER BEDS ADJACENT TO RESERVOIRS.

Capacity five million gallons every twenty-four hours.

**KEY.**

- |                              |                   |
|------------------------------|-------------------|
| A.—Cut-off Valves.           | F.—6" Gutters.    |
| B.—4" Vent Pipes.            | G.—15" Gutters.   |
| C.—8" Vent Pipes.            | H.—Supply Main.   |
| D.—Distributors.             | I.—Effluent Main. |
| E.—I Beams for Distributors. |                   |

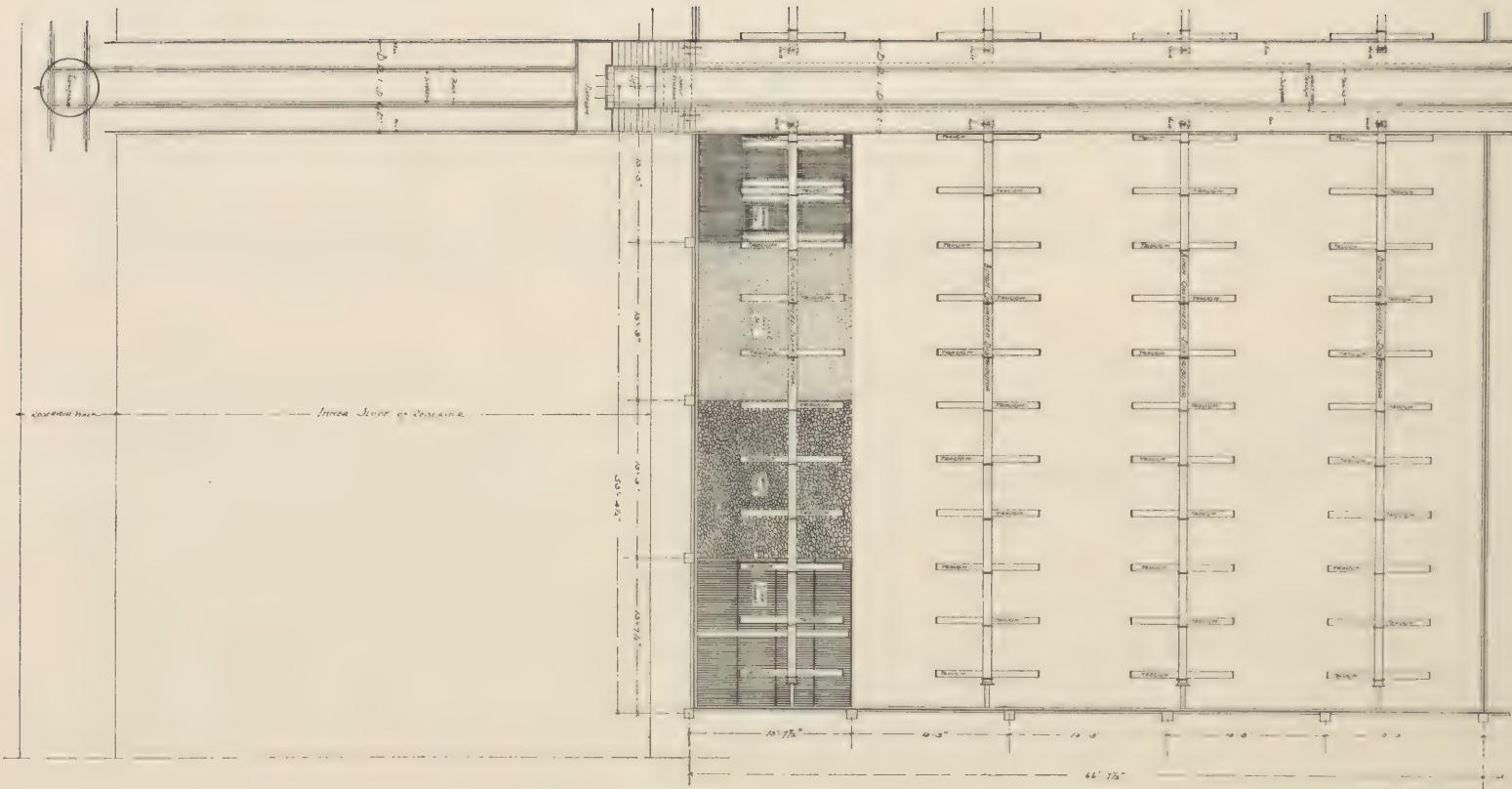
This Key is for pages 6 and 7.



ELEVATION AND SECTIONS OF FILTER BEDS ADJACENT TO RESERVOIRS.

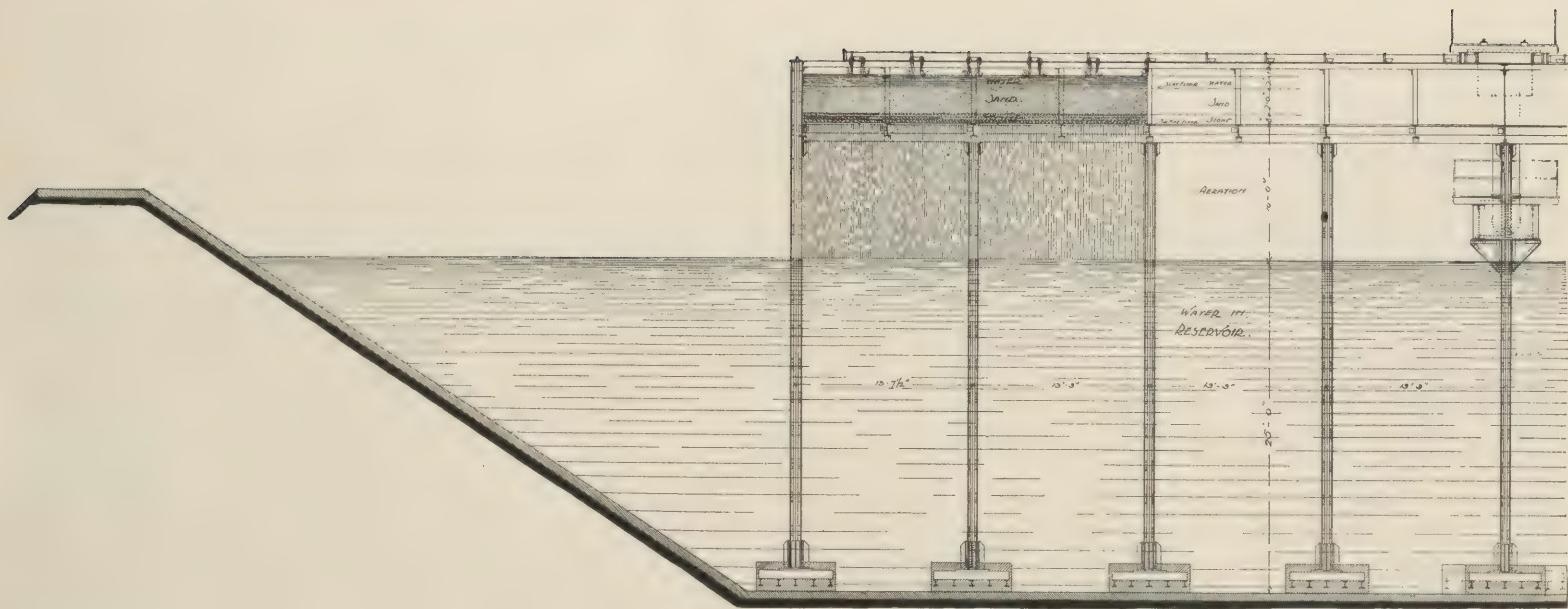
Capacity five million gallons every twenty-four hours.

## WATER PURIFICATION.



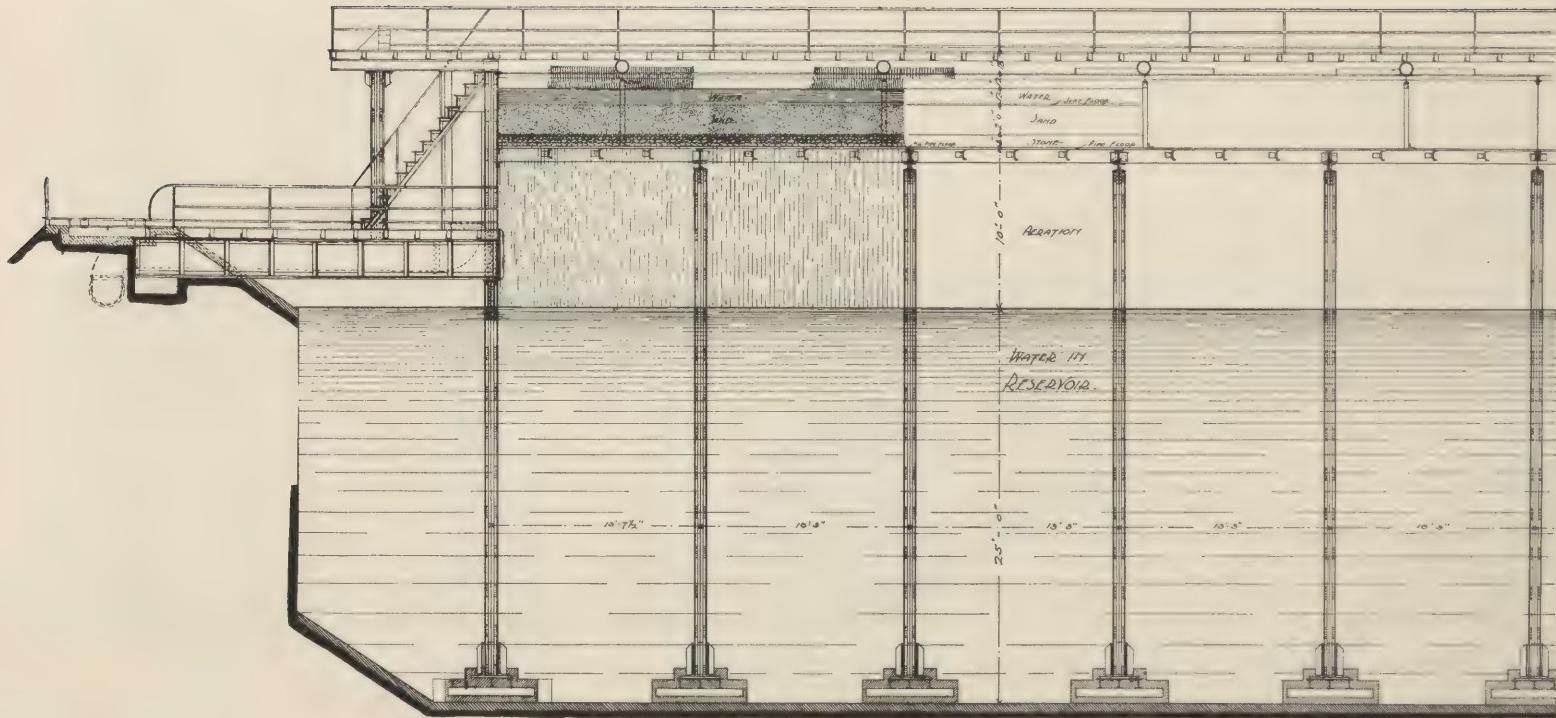
PLAN OF ELEVATED FILTER BEDS LOCATED IN AND OVER RESERVOIRS.

Capacity one million gallons every twenty-four hours.

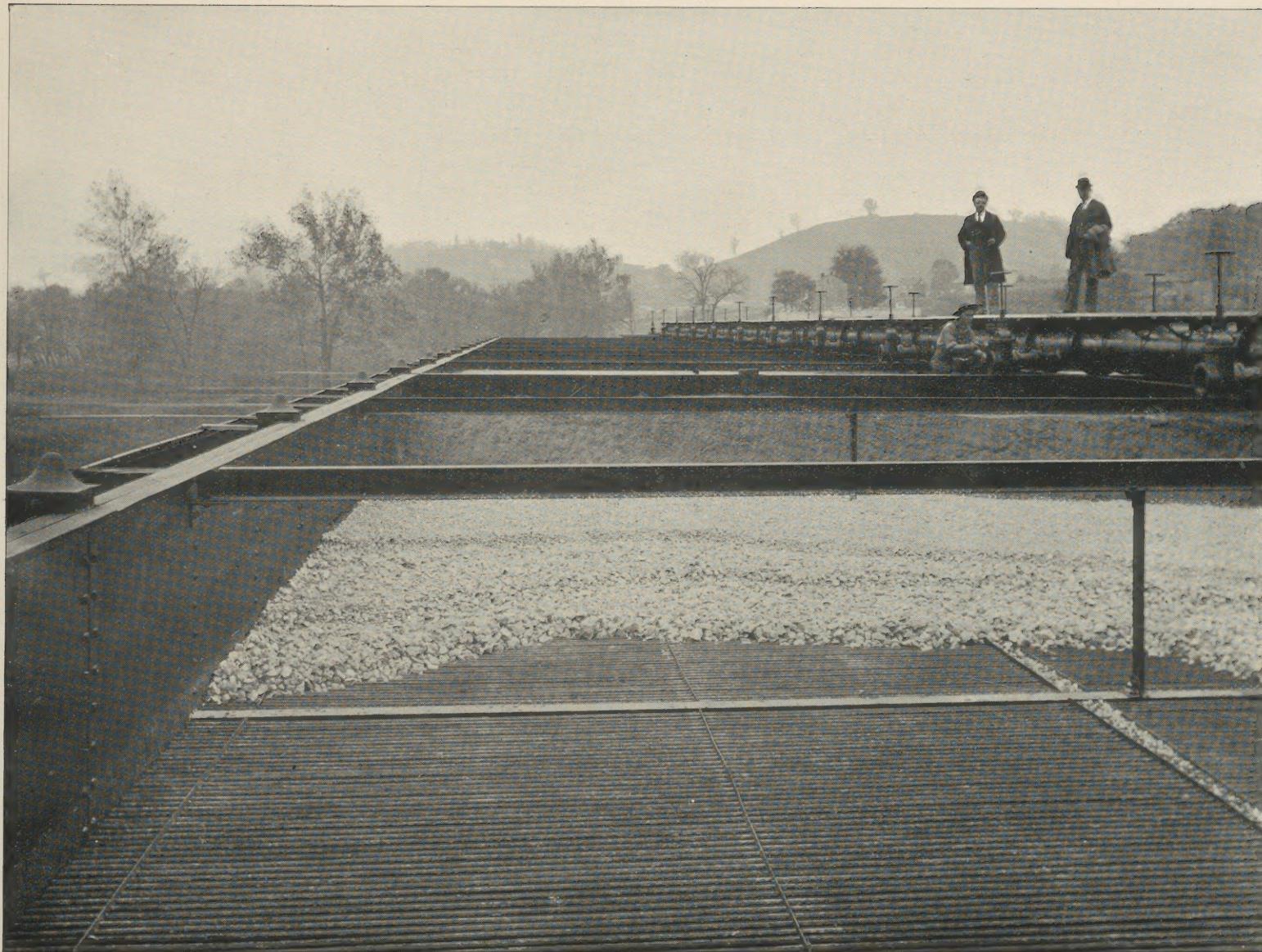


TRANSVERSE SECTION THROUGH ELEVATED FILTER BEDS LOCATED IN AND OVER RESERVOIRS.  
Capacity one million gallons every twenty-four hours.

## WATER PURIFICATION.

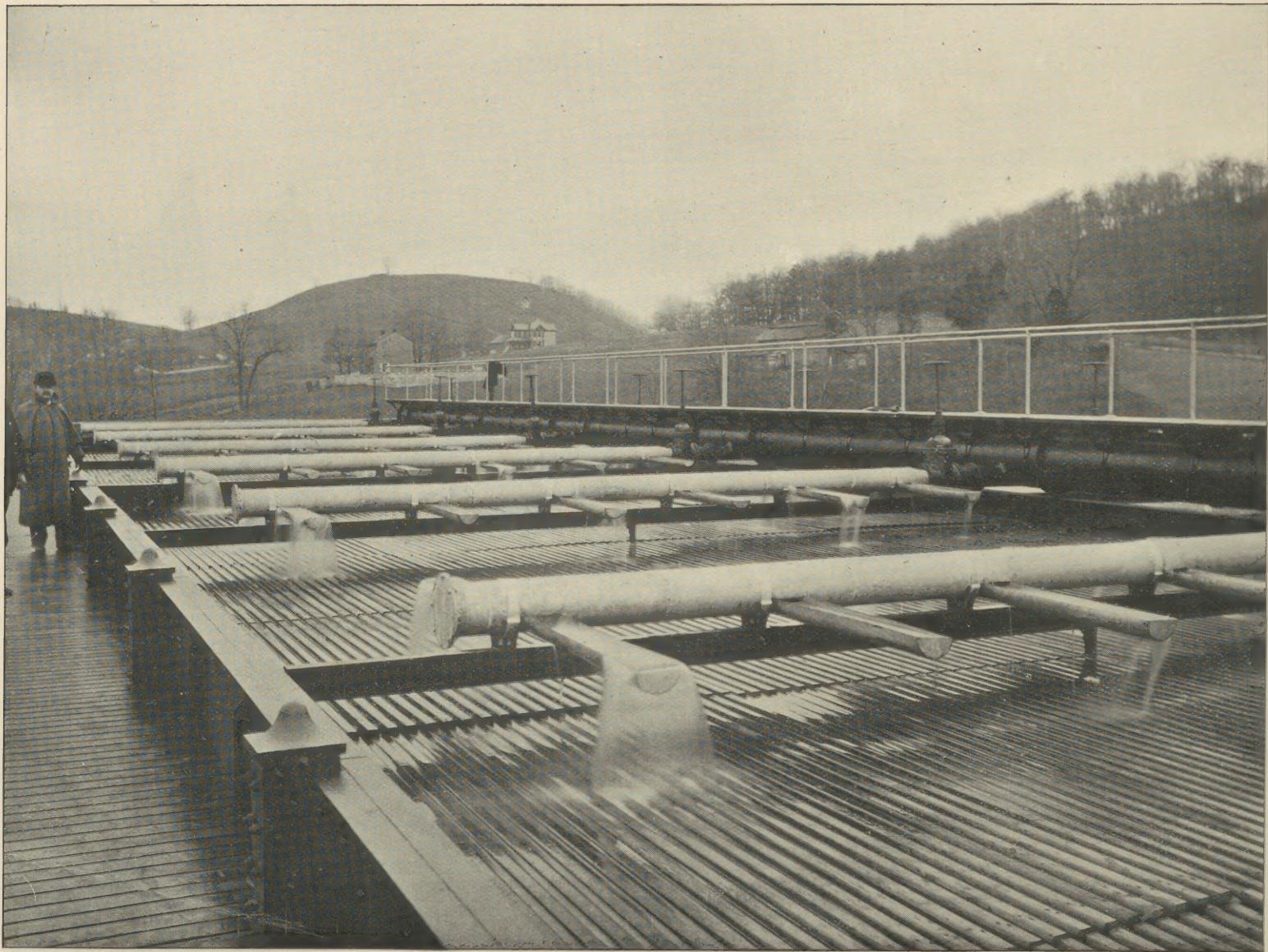


LONGITUDINAL SECTION THROUGH ELEVATED FILTER BEDS LOCATED IN AND OVER RESERVOIRS.  
Capacity one million gallons every twenty-four hours.



VIEW SHOWING FORMATION OF THE ELEVATED FILTER BEDS LOCATED IN AND OVER RESERVOIRS.

## WATER PURIFICATION.



VIEW SHOWING WATER DISTRIBUTION ON THE ELEVATED FILTER BEDS LOCATED IN AND OVER RESERVOIR.



